Architecture & Cybersecurity – Module 3

ELO-100 **Identify the features of virtualization. (Figure 3)**

ELO-060 **Identify the different components of a cloud architecture. (Service Offering View and Network View) Figure 2 (Architectural View)**

ELO-070 **Identify a difference between virtual and physical infrastructure.**

ELO-074 **Identify the 6 steps of Internet service interaction between a user on the DoDIN and a service provided over the Internet. (Figure 2 - High Level Steps of a Generic Service Interaction)**

ELO-080 **Recall the difference between virtually and physically separated infrastructure, and concerns with multi-tenancy.**

ELO-110 **Match key architectural terms from the section to appropriate definitions.**

Module – 3: Architecture

Topics

- Module Introduction
- Recapitulation
- Cloud Architecture Components
- Physical and Virtual Infrastructure
- 6 Steps of Internet Service Interaction
- Virtually and physically separated infrastructure, and concerns with multi-tenancy
- Features of Virtualization
- Key Architectural Terms
- Summary
- Module Review
- Module Summary Questions

You should be able to:

- Identify the different components of a cloud architecture.
- Identify a difference between virtual and physical infrastructure.
- Identify the 6 steps of Internet service interaction between a user on the DoDIN and a service provided over the Internet.
- Recall the difference between virtually and physically separated infrastructure, and concerns with multi-tenancy.
- Identify the features of virtualization.
- Match key architectural terms from the section to appropriate definitions.

Recapitulation of Modules – 1, 2

Topic

Review Previous Content

You should be able to:

Questions

Content

- Overview of Cloud Computing
  - Characteristics
  - Service Models
  - Deployment Models
- Risks to using Cloud
- Information Impact Levels

Cloud Architecture Introduction

Topic

Cloud Architecture Introduction

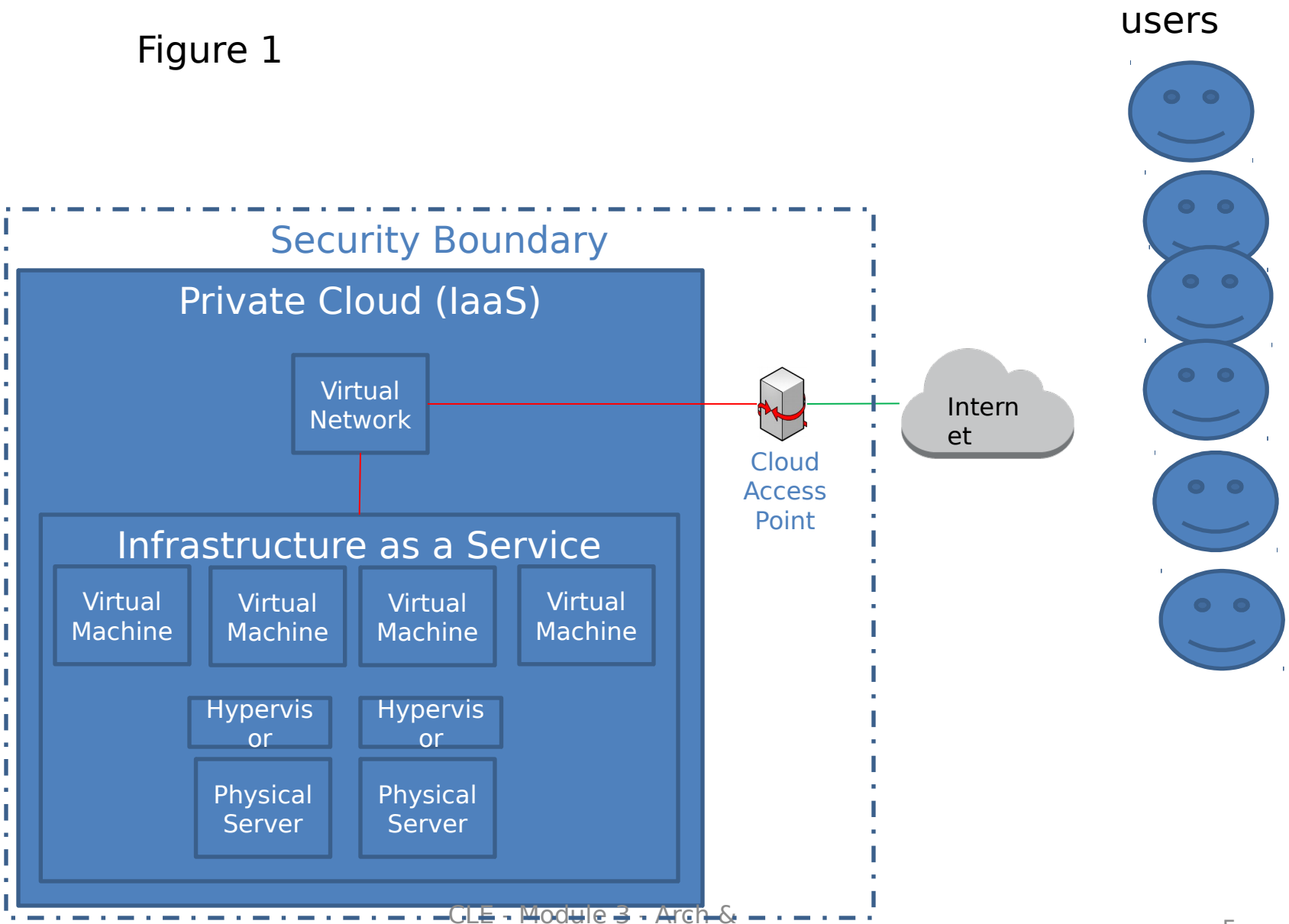
You should be able to:

Questions

Content

- Introduce cloud model diagram
- Provide foundation for definitions in module
- Figure 1 (Next Slide) presents the NIST cloud computing reference architecture, which identifies the major actors, their activities, and their functions in cloud computing. The diagram depicts a generic high-level architecture and is intended to facilitate the understanding of the requirements, uses, characteristics, and standards of cloud computing.

Figure 1


users
Security Boundary
Private Cloud (IaaS)
Virtual Network
Infrastructure as a Service
Virtual Machine
Virtual Machine
Virtual Machine
Virtual Machine
Hypervisor
Hypervisor
Physical Server
Physical Server
Cloud Access Point
Internet

Cloud Architecture Components

Topic

Cloud Architecture Components

You should be able to:

1. MT-060-01: Identify the differences between physical and virtual servers.
2. MT-060-02: Identify the role of the Hypervisor.

Questions

Content

- Overview graphic (NIST Reference Model graphic) including views of physical and virtual layers
- Physical Resources include both physical and facilities

Cloud Architecture Components -1

Topic

Cloud Architecture Components -1

You should be able to:

1. MT-060-01: Identify the differences between physical and virtual servers.
2. MT-060-02: Identify the role of the Hypervisor.

Questions

Content

- Overview graphic (NIST Reference Model graphic) including views of physical and virtual layers
- Physical servers are traditional machines, often mounted in racks in data centers (graphic).
- Physical servers include CPUs, memory, storage, power supplies and related equipment.
- Typical physical servers are managed individually as parts of an overall system implementation.
- Virtual servers act like physical servers but have networks, CPUs, storage and related items which are scalable (up or down) easily. (graphic)
- Hypervisors create hosts for virtual servers within physical servers so that one physical machine can host many virtual servers.

Cloud Architecture Components -2

Topic

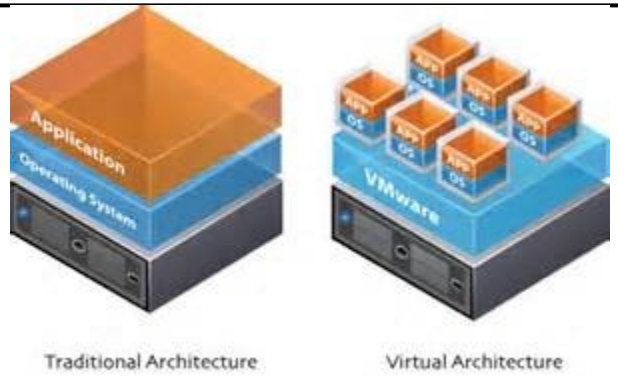
Cloud Architecture Components -2

You should be able to:

1. MT-060-03: Identify the role of the OS.
2. MT-060-04: Identify the role of software development tools

Questions

Content



- The operating system provides servers (virtual or physical) instructions on what to do.
- Software development tools provide humans with an interface and way to create programs that access computing resources. These instructions are translated by the operating system to machine instructions for the hardware.

Cloud Architecture Components -3

Topic

Review Previous Content -3

You should be able to:

1. MT-060-05: Identify common software applications that are provided to users
2. MT-060-06: Identify the role of storage devices and the types that are typically available through cloud services.

Questions

Content

- Common software applications include desktop tools like word processors, spreadsheets and other business applications.
- Storage devices provide a place to put and keep information, often in the form of files. Storage devices may be physical hard drives on a server or virtualized storage distributed across a number of resources. Examples include distributed storage using Hadoop.
- Software applications provided on cloud platforms include Software as a Service (SaaS).
- Cloud storage is an example of Infrastructure as a Service (IaaS)

Cloud Architecture Components -4

Topic

Review Previous Content -4

You should be able to:

1. MT-060-06: Identify the role of storage devices and the types that are typically available through cloud services.

Questions

Content

- Cloud storage is an example of Infrastructure as a Service (IaaS)
- Common physical storage devices include hard drives, DVDs, CDs, disk arrays.
- Common cloud storage examples include personal file storage, shared file storage, distributed high perfor
base storag

Physical and Virtual Infrastructure

Topic

Physical and Virtual Infrastructure

You should be able to:

1. MT-070-01: Identify infrastructure components that can be virtualized
2. MT-070-02: Identify the benefits of virtualizing infrastructure components

Questions

Content

- Virtualized components often include storage, RAM, CPUs, Networks, Interfaces and servers.
- The benefits of virtualization include cost reduction, scale (up or down), transfer of risk (Govt to cloud provider), rapid implementation and decommissioning of IT resources.

Features of Virtualization

Topic

Features of Virtualization

You should be able to:

1. MT-080-01: Identify the concerns with sharing servers
2. MT-080-02: Identify the concerns with sharing storage media
3. MT-080-03: Identify the concerns with sharing networks components

Questions

Content

- Shared servers may create cybersecurity risks because they operate on shared resources. While this can be mitigated risks of cross talk are higher than with physically separated and properly configured components.
- Shared storage, like servers, also have higher risks of data leakage and breach than physically separated storage.
- Shared network components also have higher cybersecurity risk than separated networks.
- In each of these cases the benefits of shared resources (cost, scale etc.) should be balanced with the risks associated with the implementation.
- Add graphics showing the concerns graphically. Cloud design patterns for each of these risks and alternatives will demonstrate risk areas.

6 Steps of Internet Service Interaction

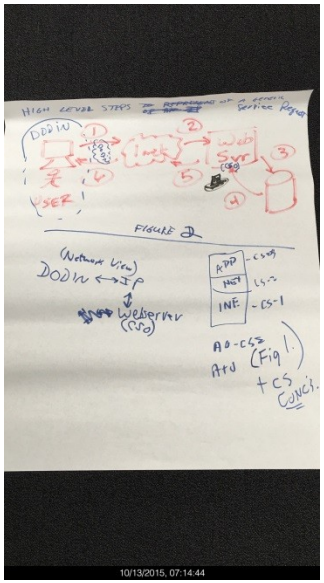
Topic

6 Steps of Internet Service Interaction

You should be able to:

1. Identify the 6 steps of Internet service interaction between a user on the DoDIN and a service provided over the Internet.

Questions



Content

- Figure 2 - High Level Steps of a Generic Service Interaction
- On the left are the *aaS. SaaS - Application. PaaS - Middleware and OS.
- IaaS - Hypervisor, Databases, Rades, Switches, Devices
- At the bottom is the DoDIN, a box with a CSO line coming out to the right
- and a line from the bottom to the letters BODI?
- At the very bottom are some lollipops, a stack -> SOA -> CLOUD.

Virtually and physically separated infrastructure, and concerns with multi-tenancy

Topic

Virtually and physically separated infrastructure, and concerns with multi-tenancy

You should be able to:

1. ELO-080 Recall the difference between virtually and physically separated infrastructure, and concerns with multi-tenancy.

Questions

Content

- Virtually separated infrastructure use hypervisors or other management software to operate separate instances of IaaS on common hardware. Physically separated infrastructure operates on equipment in different locations. The location can be a few feet or thousands of miles apart.
- Clouds that house multiple software instances, virtual machines or customers leverage common equipment. This can result in reduced performance because of the shared nature of cloud systems. This is sometimes referred to as the “noisy neighbor” problem.
- Add graphic showing images of servers that are separated and virtualized.

Key Architectural Terms

Topic

Key Architectural Terms

You should be able to:

Questions

Content

- Include definitions for:
  - Server
  - CPU
  - Memory
  - Storage
  - Hypervisor
  - Operating System (OS)
  - Virtualization
  - Network adaptor
  - Routers
  - Switch
  - Application
  - VPN
  - Include listing of references for the section

Module 3 - Review

Topic

Review

Content

You should be able to:

Questions

Module 3 – Summary Questions

Topic

Summary

Content

You should be able to:

Questions